



"The system is very intuitive to use and to configure. It provides excellent diagnostic logs and reports. Canary Labs has exceeded my expectations and I am very excited and pleased with the outcome of this project."

Troy Bower, Manager SCADA IT



Configuration Overview:

- 54 Installations of Trend Historian
- Trend Link
- Trend Web
- Centralized Control Solution
- DataSet Synchronizer

Company Overview

Kinder Morgan is one of the largest pipeline transporters and terminal operators in North America. The Kinder Morgan companies own an interest in or operate more than 37,000 miles of pipelines that transport primarily natural gas, crude oil, petroleum products and CO₂, and approximately 165 terminals that store, transfer and handle products like gasoline and coal. The Kinder Morgan companies include Kinder Morgan Energy Partners, L.P. (NYSE: KMP), Kinder Morgan Management, LLC (NYSE: KMR) and Knight Inc. (formerly known as Kinder Morgan, Inc.), a private company.

Kinder Morgan is one of Fortune magazine's Most Admired Companies. In 2008, Kinder Morgan ranked #1 in the "Pipeline Category." Among all industries in Fortune's list, Kinder Morgan ranked #1 in the "Quality of Management" categories.



Background

Kinder Morgan started using Canary Trending on the Pacific Liquids Pipeline in 2000. Wheatland Systems was contracted to provide control systems at each of the pumping stations and bulk storage terminals which included Canary as a reliable historian and trending facility. Each of the 27+ locations has dual systems, a primary and secondary historian for data collection and storage of the stations operations and performance parameters.

In 2006, Kinder Morgan wanted to consolidate the historical data from all the remote stations to two central facilities: Orange and Mission Valley. The system operations at each of the remote locations could not be affected. This was needed to support the regulatory reporting and monitoring requirements.

The historical data from each of the remote historians needed to be centralized and maintained for long term storage (minimum 3 years). A very simple and easy to use tool was needed to access the critical data for regulatory inspections.

System Requirements and Constraints

- Kinder Morgan needed the data from each of the 54+ Canary Historians at the remote locations to be consolidated back to two central data centers at Orange and Mission Valley.
- The regulatory data should be accessible from either of these two systems and they should back each other up.
- The network connection to some of the remote sites has limited bandwidth. Any file transfer must not

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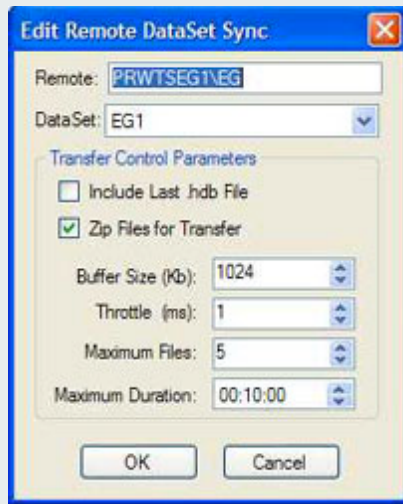
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- consume the bandwidth needed for on-going operations.
- The tool to display the data trends must be accessible from any location (via IE Browser). It must be so easy to use that it requires no training.
- Minimum impact on the systems at the remote locations.
- Centralized system management for configuration and licensing for the entire system.
- Turnkey solution with on-site installation and training.

The Solution

Canary Engineers worked with Troy Bower, Manager SCADA IT at Kinder Morgan, to understand the scope of the problem and determine the best solution. The Canary Trend Historian along with the Trend Link / Trend Web standard products handled the heart of the project, but it was determined that new tool was needed to meet the requirements of consolidating the historical data back to the central servers. The hardware solution was 2 standard Dell Servers with 2 terabyte data storage units (oversized at the request of Kinder Morgan to handle 6 years of data).



DataSet Synchronizer

The Canary Historians at the remote locations were configured to perform a file roll-over at midnight, so each day's historical data is isolated into separate .hdb data files. After the roll-over, a copy of the .hdb file from the previous day will be uploaded to the centralized server. Some features of the new tool are:

- Scheduled Upload transfer times from each remote Canary Historian
- Control of the upload network bandwidth usage from each remote site
- Automatically Zip-Unzip files to minimize network loading
- Transfer only the .hdb files that are "out of sync"
- Transfer sequence from newest to oldest .hdb data files
- Handle transferring data between the 2 centralized servers
- Communication via Dot-Net remoting
- Small, highly reliable service installed on remote system - no other changes to remote system Historian are needed
- Inform a system administrator via email on any failures or abnormal situations

How it Works

Each day the system cycles through 4 different phases of dataset synchronization. This approach places current historical data on both centralized servers and eliminates any manual switch-over procedures between the primary and backup servers. Network bandwidth to the remote sites is limited and by only uploading once from remote sites to a single centralized server, the impact on network loading is minimized.

The Orange server is considered the primary server and gets the "uploads" from the remote sites first. Each remote upload, with independent control of transfer speed, is scheduled based on hub connection and current traffic loading and network bandwidth.

All datasets (54) are then synchronized from Orange to the Mission Valley server via a fast network connection.

Then the Mission Valley tries to "sync" with the remote sites. If the Orange server is running, the current .hdb files are already in place and no additional files are transferred. If Orange server

performance



is down, the latest .hdb files are uploaded from the remote sites to Mission Valley.

The last step is for all datasets to "sync" from the Mission Valley back to the Orange server.

If either server goes off-line, the other server will continue to receive historical data without the need for a manual switch-over. When the server comes back on-line historical data is automatically synchronized from the other server. No user intervention is required.

One of the network connections to a remote site has limited bandwidth and the utilization level was very high (above 95%), leaving very small bandwidth available to transfer the .hdb data files. The "Transfer Control Parameters" allowed Kinder Mogan to slow down the transfer and limit the amount of network usage used by the DataSet Sync so the normal network communications could continue as before.

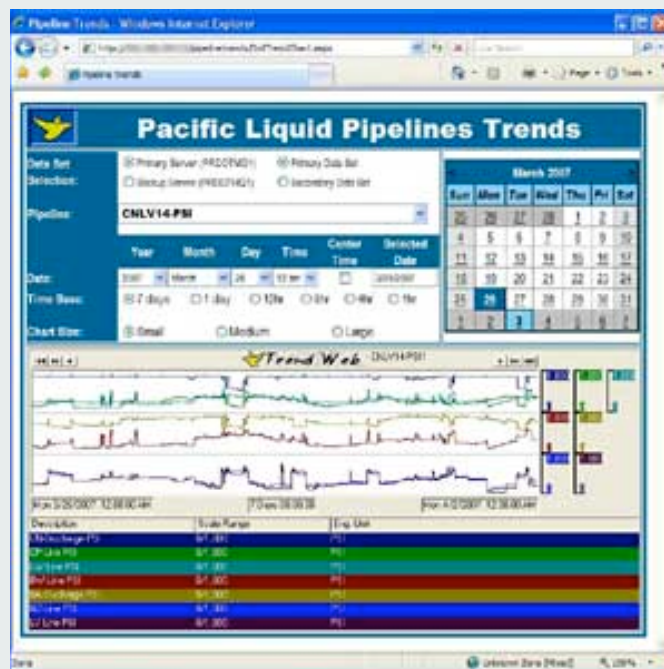
Viewing the Data

Through the Internet Explorer Browser, users access a URL on the corporate site. The page contains the general selection criteria for the regulatory data to view and incorporates the Canary Trend Web viewer.

The simple and easy-to-use selection criteria consist of:

1. Site/Pipeline Location (from drop-down list)
2. Primary or Backup Server (Orange or Mission Valley)
3. Primary or Secondary DataSets
4. Date and Time to Display
5. Time Duration of the Chart
6. Chart Size

Key performance tags for the site are predefined in a chart for each location and displayed automatically within Trend Web.



Results

This Canary solution was successfully deployed at Kinder Morgan. The DataSet Sync software was developed and delivered early. Canary was given remote access to the Orange server at Kinder Morgan for software testing and was able to prove out the system in a timely and efficient manner.

The software installation and configuration was so simple and easy it was determined that having Canary personnel on-site to perform these operations was not necessary. The training on the product was very straight forward and after walking through a demonstration via the remote link, it was evident that further training sessions were unnecessary.

Kinder Morgan now has centralized historian data for regulatory inspections, with a system that is easy to use, easy to maintain, network friendly and reliable. It displays data trends showing pipeline performance information at any location, quickly and in a format that is easy to understand. The Canary team and software has exceeded Kinder Morgan's expectations.

reliable

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